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(71) Applicant(s)  
**Thrislington Sales Limited**  
 (Incorporated in the United Kingdom)

Prince William Avenue, North Wales Trade Centre,  
 Sandycroft, DEESIDE, Chwyd, CH5 2QZ,  
 United Kingdom

(72) Inventor(s)  
**David Goodwin**

(74) Agent and/or Address for Service  
**Kilburn & Strode**  
 30 John Street, LONDON, WC1N 2DD,  
 United Kingdom

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(56) Documents Cited  
 GB 2099497 A GB 2049026 A GB 2038404 A  
 GB 1599049 A GB 0352329 A

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## (54) Door hinge

(57) A hinge comprising a first member fixed to the top of a door 22 and engaged for rotation with a second member fixed to a door frame 15. One of the two members is recessed into the door 22 or door frame 15, while the other protrudes from the door 22 or door frame 15. The first member may comprise a plate 13 formed with a spigot and the second member may comprise a sleeve 18. Means are provided to prevent disengagement of the members, such as a ball bearing 27 received in a recess formed in one member and running in a channel 25 formed in the other, or alternatively the spigot may pass through the sleeve 18 and form an enlarged shoulder. To encourage the door to come to rest at a predetermined position the channel 25 may be inclined, or the shoulder and the underside of the sleeve may be sloped.

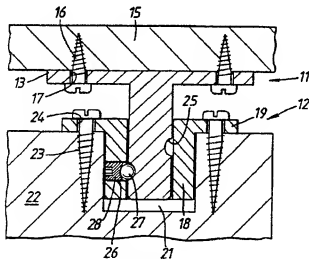


Fig.1

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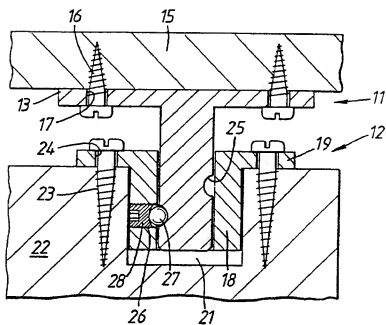


Fig.1

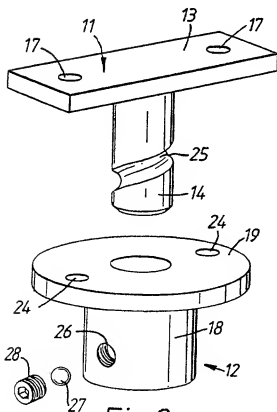


Fig.2

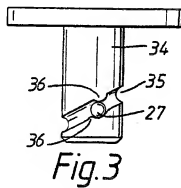


Fig.3

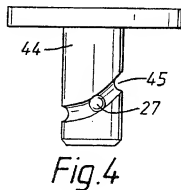


Fig.4

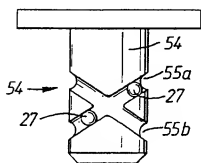


Fig.5

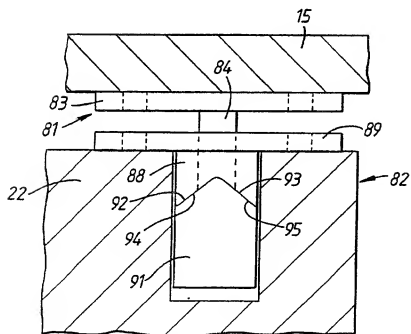
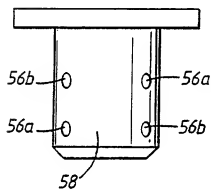


Fig.8

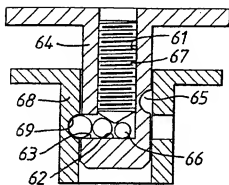


Fig. 6

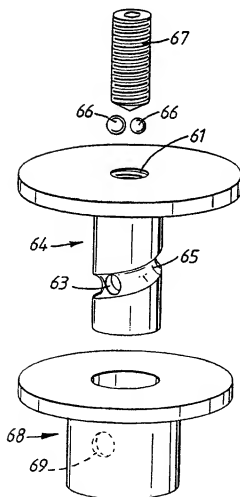


Fig. 7

Door Hinge System

The present invention relates to door hinge systems, in particular, door hinge systems for toilet cubicle doors, though the invention may be more broadly applicable to other closure members such as windows. However, for the purposes of this specification, the description will refer to doors.

Most doors are either hinged to a vertical member such as a door frame or toilet cubicle facia with conventional hinges such as a butt hinge. There are numerous types of hinge which can be used. This method generally requires a degree of accuracy to fit the door to the supporting frame and as there needs to be a fixed relationship between the door and frame on the hinge side, there is very limited on-site tolerance. The hinges are generally fixed to the face of the door and, with thin toilet cubicle facias, also the face of facia panel, and so the fixings tend to be a source of weakness unless the fixings are through type fixings which act as clamps and not as screws. Through fixings are visible on the outside face of the door and facia panel and therefore affect the overall appearance of the system. Since conventional types of hinge need to be used in pairs, two sets of through fixings are visible.

Conventional hinges can also include a feature, such as a ramp to encourage the door to fall open or closed under its own weight. This is used to ensure a toilet door, for example, closes or opens after the cubicle is vacated either to provide a neater appearance (if closed) or to indicate a free cubicle (if open).

An alternative method is to pivot the door by means of top and bottom pivots. The door is supported by the bottom fixing, either a bracket fixed to the door frame

or facia, or a foot which is fixed directly to the floor. In the case of a facia fixed bracket, the same problems of visible fixings exist and the facia also needs to be sufficiently strong to support the weight of the door. 5 With foot mounted systems, the number of feet, with a multiple door system, can appear untidy and can be an obstruction when cleaning the floor.

According to the invention, there is provided a hinge system for a door or the like which comprises a first engagement member arranged to be fixed to an upper support member and a second engagement member arranged to be fixed to a door beneath; and in which one of the engagement members is recessed into its respective support member or door while the other engagement member protrudes from its respective door or support member; the two engagement members being arranged to interengage pivotally thereby permitting relative rotation between the two engagement members about a generally vertical axis in use; the interengagement between the two engagement members being a positive interengagement in the direction of the pivotal axis in order to prevent disengagement of the two engagement members. 10 15 20

Thus, in use, the weight of the door would be supported by the support members through the positive vertical interengagement between the two engagement members. Conveniently, the support member would be a horizontal part of a door frame, or a head rail in the case of a cubicle, or perhaps a bracket attached to top of the facia. 25

With cubicle systems, a head rail is used to provide stability to the cubicle front: locking adjacent facias and division panels together. Therefore it is a strong and well supported component, making it an ideal member from which the door can be hung. It also enables the 30

pivot position to be adjustable simply by moving the two engagement members, and so the pivot, to the required position. Thus the system has on-site flexibility. It also means that the system does not require feet or any other large bottom bracket.

5 Preferably, the first engagement member comprises a plate with a protruding spigot, the plate conveniently being attached to the head rail by means of screws or bolts etc. Preferably, the second engagement member  
10 comprises a sleeve recessed within the door and arranged to receive the spigot. The sleeve is conveniently attached to the door by means of a peripheral collar or flange through which screws or bolts etc. pass into the door. It will, of course, be understood that the spigot  
15 may be recessed while the sleeve may protrude, and/or the spigot may be fixed to the door while the sleeve may be attached to the head rail.

Preferably the positive vertical interengagement between the spigot and the sleeve is achieved by means of  
20 a ball bearing which engages both components. Preferably, one of the sleeve and spigot is formed with a recess which receives the ball bearing while the other of the sleeve and spigot is formed with a groove or channel in which the ball can run, thereby allowing  
25 relative rotation. Preferably, the recess is formed in the sleeve and the groove in the surface of the spigot. The recess may take the form of a through-hole which is closed by means of a grub screw; conveniently, the grub screw has a concave distal end which can support the ball  
30 bearing.

The groove is preferably inclined with respect to the pivotal axis. In this way the weight of the door, acting through the sleeve and the ball causes the ball to run along the groove, thereby swinging the door either to

an open or a closed (or even an intermediate) position, as required, depending on the sense of the inclination of the groove. The inclination may be regularly helical or may vary in pitch. There may, of course, be more than one groove and more than one ball bearing, and the grooves may be of opposite and/or differing inclinations.

The door can be encouraged to stop at a position by incorporating an indent into the groove. It may be desirable to ensure the door sits ajar, always at a predetermined position.

The groove can be machined either clockwise or anti-clockwise, depending on whether the door is left or right handed and the spigot can have both clockwise and anti-clockwise grooves. By incorporating more than one ball into the sleeve and by positioning them carefully, it is possible to determine whether the door should be left or right handed by inserting the balls into relevant holes in the sleeve. More than one ball may be required to ensure that a ball does not drop onto the opposite groove when the ball is passing over an intersection between two grooves.

In an alternative embodiment, the spigot has a hollow tapped core, a hole opening from the base of the groove into the hollow bore, and optionally a number of preferably smaller ball bearings located in the bottom of the hollow bore adjacent the hole. The smaller ball bearings may be held in position by a pointed grub screw in the hollow bore. The sleeve may have a blind hole offset from the through-hole.

Thus, a main ball bearing can be inserted through the through-hole in the sleeve and into (but not through) the hole in the groove formed in the spigot. By relative rotation, the main ball bearing can then be rotated until it drops into the blind hole. More preferably however,



the main ball bearing is inserted into the blind hole via the hollow bore with the grub screw absent. It can then be held in position, partly in the blind hole and partly in the groove by tightening down the grub screw which may then act on the smaller ball bearings, so forcing them outwards or, more preferably the grub screw may act directly on the main ball bearing.

It will be appreciated that the grub screw could be replaced by any equivalent feature which acted to urge the main ball bearing into the blind hole.

In another alternative embodiment, the spigot passes right through the sleeve and is formed with a shoulder which engages the under surface of the sleeve to provide a positive vertical engagement. Preferably the shoulder and the under surface of the sleeve are inclined so that relative rotation of spigot and sleeve results in relative movement in the direction of the axis of rotation. Preferably, the inclination is regularly helical. There may be more than one respective inclined portions, for example two in opposite senses.

Preferably, in all cases, a lower bracket is provided simply to locate the bottom of the door.

The ball bearings are preferably made of stainless steel.

The invention may be carried into practice in various ways and some embodiments will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a schematic vertical cross-section through a part of a cubicle employing a hinge system in accordance with the invention;

Figure 2 is an exploded perspective view of the hinge system of Figure 1;

Figures 3 and 4 are front elevations of one of the

hinge components in accordance with two further embodiments;

Figure 5 is a front elevation of the two hinge components in accordance with a fourth embodiment; and

5        Figures 6 and 7 are views similar to Figures 1 and 2 showing a fifth embodiment; and

Figure 8 is a view similar to Figure 1 showing a sixth embodiment.

Referring first to Figures 1 and 2, the hinge system  
10        comprises an upper hinge member 11 and a lower hinge member 12. The upper hinge member 12 comprises a plate 13 and a downwardly protruding spigot 14; it is screwed to a head rail 15 by means of screws 16 which pass through holes 17 in the plates 13. The lower hinge  
15        member 12 comprises a sleeve 18 with a peripheral collar 19. The sleeve 18 is located in an aperture 21 in door 22 and is screwed in place by means of screws 23 which pass through holes 24 in the collar 19.

The spigot 14 is formed with a helical groove 25 in  
20        its surface. In cross-section, the base of the groove 25 is a smooth curve. The sleeve 18 is formed with a tapped through-hole 26.

The spigot 14 is cylindrical in section and dimensioned to fit rotatably within the sleeve 18, which  
25        is also cylindrical. A ball bearing 27 is located in the through-hole 26 and protrudes into the groove 25. It is held captive and is adjustable by means of a grub screw 28 which has a concave end.

When the components are in position and the hinge  
30        members 11,12 are located for use, it will be appreciated that the weight of the door 22 is supported by the head rail 15, through the sleeve 18 and spigot 14 which are prevented from vertical separation by the interaction of the ball bearing 27 on the groove 25 and the through-hole

26. However, as the door is opened or closed, the sleeve 18 rotates relative to the spigot 14 and the ball bearing 27 is constrained to move along the groove 25. As it does so, the door 22 rises or drops, depending on the direction of inclination of the groove 25 and the sense of rotation of the sleeve 18.

Thus, the door 22 can be arranged to close or to open under its own weight, whether it is right-handed or left-handed, by selecting the appropriate direction of inclination for the groove 25. In the case shown in Figures 1 and 2, if it is assumed that in Figure 1 the door 22 is closed and opens forwards out of the page, the door 22 would rise on opening and would then tend to close under its own weight.

There may, of course be a second groove (not shown) and a second through-hole and ball bearing (also not shown) on the opposite sides of the spigot 14 and sleeve 18, respectively.

Figure 3 shows an alternative design of spigot 34. In this case, the groove 35 has an indentation 36 which acts to interrupt the progress of the ball bearing 27 along the groove 35. The indentation 36 is so dimensioned that when the door is opened, the ball bearing 27 clicks past, however, when the door closes (or opens) under its own weight, the interruption is sufficient to halt the progress of the door. In this way, the door can be made to reside naturally at an intermediate position.

In the embodiment shown in Figure 4, the spigot 44 has a groove 45 whose angle of inclination varies. In use, this results in a variation in the speed of the door as it opens or closes under its own weight.

For example, a fast initial acceleration may be required with a slow or gentle deceleration. This would

help the door to start to close or open, thereby overcoming any resistance, but would bring the door safely to a stop without banging into the partition panel or wall.

5        In the embodiment shown in Figure 5, the spigot 54 has two grooves 55a and 55b which have opposite inclinations. There are two ball bearings 27 and two pairs of through-holes 56a and 56b in the sleeve 58, each pair corresponding with one of the grooves 55a and 55b.  
10        By selecting one or other of pairs of through-holes 56a, 56b, the door can be arranged to be left- or right-handed and to close or open.

      In the embodiments shown in Figures 6 and 7, the spigot 64 has a tapped hollow bore. 61 terminating at a  
15        base 62. A hole 63 leads from the bore 61 at the base 62 through to the helical groove 65. A series of small ball bearings 66 are located at the base 62 of the bore 61 (though these ball bearings 66 are optional). A grub screw 67 is located in the tapped central bore.

20        The sleeve 68 has a blind hole 69 in its inner surface which is formed by drilling through the sleeve 68 from the opposite side.

      In use, the main ball bearing 27 is inserted into the bore 61 and is dropped into the blind hole 69 via the  
25        hole 63. The grub screw 67 is then inserted and tightened down, optionally with the small ball bearings 66 in position. Thus, the main ball bearing 27 is held captive in the blind hole 69 and is free to run along the groove 65 as relative rotation of the spigot 64 and  
30        sleeve 68 takes place.

      It will be appreciated that the features described in the embodiments of Figures 1 to 7 can be combined.

      In the embodiment of Figure 8, the upper hinge member 81 comprises a plate 83 and a spigot 84, and the

lower hinge member 82 comprises a sleeve 88 and a collar 89. However, the spigot 84 has a head 91 at its lower end with two inclined helical shoulders 92,93. The sleeve 88 has two corresponding helical ramps 94,95 along its under surface. Thus, rotation of the sleeve 88 relative to the spigot 84 will cause the sleeve 88 to rise as one or other of the shoulders 92,93 travels up the corresponding ramp 94,95.

In a variation on this embodiment, a single shoulder and a single ramp may be provided or indeed a plurality of shoulders and respective ramps, preferably two, extending in the same sense. Furthermore, the shoulder(s) and ramp(s) may have varying angles of inclination in a way similar to that shown in Figure 4.

## Claims:

1. A hinge system for a door characterised in that it comprises a first engagement member arranged to be fixed to an upper support member and a second engagement member arranged to be fixed to a door beneath; and in which one of the engagement members is recessed into its respective support member or door while the other engagement member protrudes from its respective door or support member; the two engagement members being arranged to interengage pivotally thereby permitting relative rotation between the two engagement members about a generally vertical axis in use; the interengagement between the two engagement members being a positive interengagement in the direction of the pivotal axis in order to prevent disengagement of the two engagement members.
2. A hinge system as claimed in Claim 1, characterised in that the first engagement member comprises a plate with a protruding spigot while the second engagement member comprises a sleeve arranged to receive the spigot.
3. A hinge arrangement as claimed in Claim 2, characterised in that the sleeve has a peripheral collar or flange through which screws or bolts can pass.
4. A hinge arrangement as claimed in Claim 2 or Claim 3, characterised in that the spigot passes right through the sleeve and is formed with a shoulder which engages the under surface of the sleeve to provide the positive vertical engagement.
5. A hinge arrangement as claimed in Claim 4, characterised in that the shoulder and under surface of the sleeve are inclined so that relative rotation of the

spigot and sleeve results in relative movement in the direction of the axis of rotation.

5 6. A hinge arrangement as claimed in Claim 5, characterised in that the inclination is regularly helical.

10 7. A hinge arrangement as claimed in Claim 5 or Claim 6, characterised in that there are more than one respective inclined portions on the shoulder and sleeve.

15 8. A hinge arrangement as claimed in any of Claims 1 to 3, characterised in that the positive vertical engagement between the spigot and the sleeve is achieved by means of a ball bearing which engages both components, one of the sleeve and spigot being formed with a recess which receives the ball bearing while the other of the sleeve and spigot is formed with a groove or channel in which the ball can roll thereby allowing relative rotation.

20 9. A hinge arrangement as claimed in Claim 8, characterised in that the groove is inclined with respect to the pivotal axis.

25 10. A door construction comprising a door and a head rail, characterised in that they are connected by means of a hinge arrangement as claimed in any preceding Claim, the first engagement member being fixed to the headrail and the second engagement member being fixed to the door.

30 11. A door construction as claimed in Claim 10, characterised in that the plate from which the spigot protrudes is attached to the headrail by means of screws or bolts and the peripheral flange attached to the sleeve

is attached to the door by means of screws or bolts, the sleeve being recessed within the door.

- 5      12. A hinge system constructed and arranged substantially as herein specifically described with reference to and as shown in Figures 1 to 3, Figure 4, Figure 5, Figures 6 and 7 or Figure 8 of the accompanying drawings.





Application No: GB 9611092.9  
Claims searched: 1-12

Examiner: Martin Riley  
Date of search: 29 July 1997

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): E2F (FCD, FCE, FCX, FEA)

Int Cl (Ed.6): E05D 5/08, 5/12, 7/08; E05F 1/06

Other: Online: WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
Y	GB 2099497 A (PEI-LIANG) - see page 2, lines 44-55	8,9
X,Y	GB 2049026 A (HETTICH) - see page 1, lines 65-78 and figure 2	X:1,2,10 Y:4-9,11
Y	GB 2038404 A (HORI) - see page 1, lines 90-104	5,6,7
X,Y	GB 1599049 A (KVA-SPIL) - see page 3, lines 58-75	X:1,2 Y:4-9,11
X,Y	GB 0352329 A (MOUNTFORD) - see page 3, lines 67-78	X:1,10 Y:4-9,11

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